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Spy Satellites: 'Secret, But Much Is Known

By Jeffrey T. Richelson and William M. Arkin

ON DEC. 19, The Washington Post published a brief description of the secret eavesdropping satellite that the United States will put into orbit this month on flight 51-C of the space shuttle. The Post's story, which should have been routine, set off a furor, led by Defense Secretary Caspar Weinberger, who said the newspaper was helping the Soviet Union.

Lost in the uproar was the fact that America's "secret" intelligence programs designed to pick up Soviet communications and other electronic signals from space are not a secret at all — that actually, specialists who follow this field know a great deal about what is going on without any access to secret information.

The Post wrote that the shuttle will deploy "a new military intelligence satellite that is to collect electronic signals and retransmit them to a U.S. receiving station on Earth." The Post described the \$300 million satellite as "the most important and largest" of "four or five" already in space.

But careful students of this subject already knew that, and a lot more. They get their information from a variety of sources, including: the major newspapers; Aviation Week & Space Technology magazine (a McGraw-Hill weekly), particularly its "Washington Round-up" column; official statements from American government agencies in congressional testimony and from other governments, particularly Australia's; specialized journals like JBIS, (the Journal of the British Interplanetary Society), and Air Force, monthly publication of the Air Force Association; and from periodic technical conferences where specialists share information.

The Post story never had an opportunity

to be routine because it came on the heels of an unprecedented press briefing by Brig. Gen. Richard Abel, chief of Air Force public affairs, who threatened to investigate anyone who even "speculated" about the content or capability of the shuttle's secret military operations. "We are working to deny our adversaries any information that might reveal the identity or missions of our DOD [Department of Defense] payloads," Abel said. This followed private discussions between Secretary of Defense Caspar Weinberger and the three television networks, the Associated Press and Aviation Week & Space Technology magazine, in which the secretary also claimed that disclosure of the shuttle payload "could seriously endanger national security."

Few aspects of U.S. intelligence collection are more sensitive to the keepers of official secrets than operations from space. The Post's story, however, revealed nothing that should upset them. Though the secretary of defense claims the Post's revelation harmed "national security," it did no such thing, since the Soviets were well aware of our ability to collect signals from space, and since the information in The Post article was easily deducible from information available in congressional testimony, Aviation Week, The New York Times, official Australian announcements and other unclassified sources. The administration's secrecy policy may be at stake, but national security isn't measured by the shade of purple a government official's face turns when he picks up his morning paper.

When the space shuttle Discovery places its intelligence satellite into orbit, it will mark the 24th year the United States has been using satellites to collect signals intelligence. In March 1962, the United States launched its first "electronics intelligence" (ELINT) satellite into a 300-mile circular orbit with the mission of collecting electronic signals from Soviet and Chinese radars. Precise information about radar locations and operating characteristics was vital for U.S. bombers to evade Soviet and Chinese air defenses in the event of nuclear war.

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This type of satellite, known as a ferret (see Glossary in next column), has since been produced in several different versions. Because of its relatively small size, a ferret satellite is commonly "piggybacked" into space — launched along with photographic reconnaissance and other satellites and then shot off into its own distinct low-flying orbit. Ferret satellites have been written about openly for years, both in technical and general journals; for example, *Spaceflight*, a journal of the British Interplanetary Society.

While the ferret program was in its early stages the Central Intelligence Agency began a new program, codenamed Rhyolite, to develop a new satellite to intercept communications. Rhyolite satellites (the subject of major news stories in the late '70s after it was discovered that an American technician, Christopher Boyce, had sold information about Rhyolite to the Soviets) were to be placed in geosynchronous orbit — an orbit that matches the rotation of the earth so closely that the satellite would hover over a single point on earth. The laws of physics dictate the nearest location to earth for this orbit, 22,300 miles above the equator.

When Rhyolite was first launched in 1970 (with four subsequent launches in 1973, 1977, and 1978) it gave the United States completely new intelligence capabilities, described in an article by Philip Klass in *Aviation Week* of May 14, 1979. (Robert Lindsey of *The New York Times* disclosed additional details about Rhyolite in his reporting and a subsequent book on the sale of Rhyolite secrets, "The Falcon and the Snowman," published in 1979. Many of the details came from the government's espionage case against Boyce presented in open court.)

Perched over the Indian Ocean and Singapore, Rhyolite satellites could electronically view large portions of the Soviet Union and China and intercept a wide range of radio and microwave signals, particularly those that were not within "line-of-sight" of SIGINT ground stations. (More about them in a moment.) The communications that Rhyolites could intercept included diplomatic, military, political and commercial communications transmitted by radio, radiotelephone, microwave towers and satellites. Rhyolite could routinely intercept communications between military units engaged in exercises and training, long distance telephone conversations and government dispatches, as well as communications sent via INTELSTAT.

In addition to their communications interception mission, Klass and Lindsey revealed, the Indian Ocean satellite was also intended to intercept telemetry (see box) from Soviet missiles launched from Tyuratam in the U.S.S.R. towards the Soviet Far East and Pacific Ocean. The Singapore satellite was intended to monitor telemetry from shorter range SS-16 and SS-20 missiles launched from Plesetsk in the northern Soviet Union.

(Of course, collecting and recording hundreds of thousands, even millions of messages is only useful if they can be efficiently processed and/or decoded. Analysts must disentangle a multitude of different communications streams and then interpret the information they contain. This task is assigned to the giant computer complexes of the National Security Agency, described in James Bamford's book, "The Puzzle Palace.")

Following the success of the Rhyolite program two additional "communications intelligence" (COMINT) satellites were initiated and completed. The existence of one of these satellites, codenamed Chalet, was first revealed in *The New York Times* in 1979 by reporter (now Assistant Secretary of State for European Affairs) Richard Burt. Burt's disclosure almost cost him his present job: Sen. Jesse Helms (R-N.C.) and several other GOP senators used it and the disclosure of an antenna system in Norway as grounds for opposing Burt's nomination.

Burt's article provided the first public revelation of Chalet's existence, and about as many details on that satellite as the Post's article did on the new SIGINT satellite. Burt wrote that while designed solely for communications intelligence, Chalet was being reconfigured for telemetry interception to improve U.S. capabilities to verify Soviet compliance with SALT II. Chalet launches apparently occurred on June 10, 1978, Oct. 1, 1979 and Oct. 31, 1981. "Apparently" because there is no official confirmation of Chalet launches, but these dates can be deduced from open sources of information, including the National Aeronautics and Space Administration's quarterly Satellite Situation Report and open Air Force testimony to the armed services and appropriations committees of Congress. (See accompanying article for an explanation of how such deductions can be made.)

The third type of SIGINT satellite, whose codename has never been revealed but whose existence can also be deduced from open sources (see accompanying article), began operating in March 1975 in a highly elliptical orbit. This third type of SIGINT satellite comes as close as 200 miles to earth at its lowest point and moves as far as 24,000 miles away at its high point. The peculiar nature of its orbit allows it to hover near its high point for eight hours over the Arctic and northern Soviet Union, where it can monitor communications and signal traffic from Soviet facilities in the Arctic, such as bomber staging bases and the Murmansk naval complex. The Air Force launched the second of these third-type satellites on Aug. 6, 1976, and probably several more since then.

The planned follow-on to Rhyolite and Chalet satellites, codenamed Argus, was initiated but never completed in its original form. According to the 1979 Klass article in

Aviation Week, Argus was to have had an antenna twice the size of Rhyolite and greater collection capability. While supported by CIA Director William Colby and President Gerald R. Ford, it was opposed by Defense Secretary James Schlesinger who, under the constraint of a limited budget for reconnaissance activities, preferred to maintain a high level of photographic coverage of the Soviet Union. According to information in *Aviation Week* and in Colby's memoirs, when news of this dispute reached the congressional oversight committee, it killed funding for the Argus program. Then came the discovery in 1977 that TRW employee Christopher Boyce had sold the Soviet Union information on Rhyolite.

Boyce, a \$145-a-week code clerk at TRW in El Segundo, Calif., had been assigned to the "Black Vault" — the top security room where — we learned from Boyce's trial on espionage charges — TRW stored information on the design and operation of several secret U.S. satellite systems built by TRW. In addition to Rhyolite, TRW was the contractor for the Keyhole-11 (KH-11) photographic reconnaissance satellite (first launched in December 1976) and the Pyramider agent communications satellite system, which was never built. According to *Aviation Week*, Pyramider would have allowed agents in "denied areas" (e.g., the Soviet Union, Eastern Europe, Vietnam) to communicate instantaneously with CIA headquarters in Langley, Va., by means of a calculator-sized transceiver.

In 1975, with the aid of his childhood friend Andrew Daulton Lee, Boyce began providing the Soviet Union with information on both Pyramider and Rhyolite. (This was before CIA employee William Kampiles sold the technical manual for the KH-11 to the KGB in 1977.) Exactly what information Boyce provided is not known publicly, and perhaps not even to the government. But it is inevitable that Boyce's information told the Soviets that Rhyolite existed, and de-

scribed its purpose and capabilities — assuming the Soviets had not already figured it all out.

Boyce's disclosures were followed by the loss of two Iranian monitoring stations when the shah fell. The same year plans for a Rhyolite follow-on satellite were revived. The secret satellite to be placed in geosynchronous orbit by the space shuttle *Discovery* is the result of those plans.

The government presumes that its intelligence gathering requires total secrecy. But the case for suppressing stories like the one that appeared in the Post does not stand up against the realities of the Soviets' ability to gather intelligence on U.S. space activities.

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When the Air Force claims that "The more mission information they [the Soviets] have, the easier it is for them to counter the capabilities of those payloads" they are living a pipe dream. The United States and Soviet Union both maintain vast networks that collect information about the other's eavesdropping activities. Each superpower's space monitoring networks include detection and tracking radars, telescopes that can see out to geosynchronous altitudes, ships equipped with electronic eavesdropping equipment, satellites and land-based antenna "farms" that intercept data transmitted between satellites and ground stations.

Thus, despite the blanket secrecy the Soviet Union maintains about its military space program — secrecy that extends to denying such a program exists — the United States collects an enormous amount of information about Soviet space programs by rather simple means. Indeed, even private individuals armed with basic radio gear have managed to decipher large portions of Soviet space operations. For years, the recently retired Geoffrey Perry, with the aid of his students at the Kettering Grammar School in England, have monitored the transmissions to and from Soviet satellites. With the aid of this data Perry has written numerous authoritative articles on the Soviet military space program, including Soviet photographic reconnaissance and signals intelligence satellites. It seems likely, even inevitable, that the Soviets can do at least as well deciphering the U.S. program as those schoolboys, particularly when operating against a far more open society.

The most conclusive evidence for the Soviets that a new generation of SIGINT satellites was in the offing came not from the Washington media but from observing U.S. intelligence collection activities in Alice Springs, Australia — an installation known as Pine Gap. There the United States maintains the Joint Defense Space Research Facility, long known (and publicly discussed in Australia) as the Pacific ground station for the Rhyolite satellites.

For some time, work has been underway to expand the Pine Gap facility (this expansion was discussed in two official announcements, one in 1983 and another in '84, from the Australian Defense Ministry). American aircraft bringing equipment for Pine Gap land at a public airport. The Australian defense minister has publicly announced the arrival of one key piece of equipment. Tipped off by information like this, the Soviets can no doubt use their photographic reconnaissance satellites and, presumably, human agents, to observe an enormous amount of construction at Pine Gap. This construction — openly discussed in Australia — has added numerous new "radomes" to house new antennas. Soviet analysts looking at the photographs from their satellites and then noting the increase in electronic signals in and out of Pine Gap could only conclude that Discovery had placed a new-generation SIGINT satellite into orbit.

Even if all the above clues had totally evaded Soviet eyes, the Soviet Union, like the media, could have picked up the many clues that a SIGINT satellite launch was to be expected. The trade magazine *Aviation Week & Space Technology* carried stories in 1979 about plans for the Rhyolite follow-on while the Air Force was telling congressional armed services and appropriations committees about plans for shuttle missions which would require use of the Inertial Upper Stage (IUS) — a rocket within the shuttle which will propel the new SIGINT satellite into geosynchronous orbit. Further, in as much as the Air Force has publicly stated (also in congressional testimony) that the shuttle would not be used to launch a new infrared-detecting early warning satellite until 1986 and there had recently been a communications satellite launch, only a SIGINT satellite remained as the possible payload for geosynchronous placement.

The secrecy that surrounds the satellite reconnaissance program is, to a large extent, a vestige of its early days, when the Pentagon feared that acknowledgement of U.S. satellite flights over Soviet territory would so embarrass the Soviet leadership that they would be tempted to shoot down satellites — just as they had shot down the U-2 in 1960. Hence, even the existence of the organization coordinating such activities — the National Reconnaissance Office — was (and still is) considered a secret by the Pentagon. It was not until 1978 that the U.S. government officially admitted that photographic reconnaissance satellites existed. This high level of secrecy attached to U.S. satellite reconnaissance activities is not justified on any grounds.

If the Soviets ever had any doubt about the viability of SIGINT collection from space, Boyce ended their doubts. Once he delivered the first material on Rhyolite to the Russians, the "genie" was out of the bottle. But even without Boyce's information the Soviet Union has always taken steps to protect vital communications — even without knowledge of specific interception systems targeted against those communications — partly because of its general paranoia about U.S. intelligence activities, partly because of its reflexive attachment to secrecy.

Thus the Soviets use open radio transmissions as little as possible for sensitive communications and rely heavily on cables and landlines (which can only be intercepted by physically tapping into the line). Likewise, Soviet encryption of signals like missile te-

lemetry, often blamed on Boyce's disclosures, began prior to the disclosures, according to an informed source, and is a routine security practice. It seems likely that the

motivation for encryption of missile telemetry was not discovery of Rhyolite but rather the beginnings of the Soviet multiple warhead (MIRV) testing program. When Soviet ballistic missile testing involved only single warhead missiles the United States was able to obtain the information it required via radar — hence, Soviet encryption would not have denied the United States any information of value. With multiple warheads, information about numbers of warheads, their design and accuracy could be obtained only from telemetry interception.

For many years until the fall of the shah in 1979, the U.S. operated antennas in Iran for the interception of Soviet missile telemetry. The Soviet Union must have known of these antennas from their own intelligence sources, and must have taken pictures of them, which would have revealed their likely purposes. Then, during the SALT II debate in Washington, they learned definitively what the Iranian antennas were for.

Today the United States operates a variety of antennas and radars in Turkey, China, Norway and Japan — all targeted on the Soviet Union. The Soviets know of these antennas and their purpose, yet no one has claimed that they are anything but valuable intelligence assets. Their operations are not jeopardized by public revelation of the existence of the sites, nor is there any evidence of Soviet jamming or electronic countermeasures to ground SIGINT collection. The biggest impediment to signals interception on the ground, as well as by satellites, is not active countermeasures, but encryption.

If the Soviets already know the important details about our space-based intelligence activities, why is there so much official concern about keeping them secret? Probably because of a combination of inertia, bureaucratic power plays and a total contempt for the public's "right to know."

Faced with the disclosures in the Post, officials admitted that it would have been extremely difficult to keep the satellite's mission secret but suggested, in the words of one official, that it was "worth the try" and that they wanted to "mess with [the Soviets] minds" (these quotations are from *The New York Times*).

This suggests a more important issue than the simple question whether the purpose of this particular satellite could be kept secret. Wouldn't a campaign of absolute secrecy against the media, if it succeeded, prevent the public from being informed about a very important and costly part of U.S. intelligence activities? Yes it would, and such secrecy would make it impossible for non-government experts or private citizens to evaluate the validity of Defense Department claims of Soviet weapons development or to assess

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desirability of our defense establishment's programs.

Broader public understanding of how the United States collects intelligence, on the other hand, would make the government more accountable for a \$14 billion dollar program whose workings are — despite widespread ignorance about them — a subject of constant public debate within a community of specialists. Evaluations of Soviet weapons systems and development programs, verification of arms control treaties, evidence of Soviet cheating, questions about the role of intelligence collection in the shooting down of Korean Air Lines Flight 007 and false claims about deployment of MIG aircraft to Nicaragua have all been major news stories over the past two years. Wider understanding of the information available to the United States about such matters would vastly improve the quality of the public debate.

In the next five years, some 30 secret military missions for the space shuttle are scheduled. For the first time since the Gemini program, communications between the mission control center and outer space on manned space missions will be encrypted. At a time when anti-satellite operations and "Star Wars" are at the top of the superpowers' agendas, is it in our national interest to mess with Soviet minds (and everyone else's) by added secrecy in any aspect of the space program? We think not.

The administration apparently believes it is legitimate to deny information to the public on intelligence matters as long as there is the slightest chance of making the Soviet Union's acquisition of information more difficult or causing it the slightest confusion. This attitude has already led the administration to classify a greater amount of information about low-yield nuclear testing, research and development programs, nuclear weapons and naval and air operations. But it is an attitude that is totally incompatible with the operation of government in a free society.

This entire shuttle incident indicates a disturbing respect for Soviet secrecy practices, and an unfortunate desire to mimic them. Thus Secretary Weinberger stated at a press conference on Dec. 18: "The Soviets keep practically everything secret and nobody says that's provocative."

Secrecy does serve a purpose for the bureaucracy. The Pentagon and intelligence community thrive on their own "classified" leaks — selective revelations intended to scare us about Soviet programs, or to promote American ones. Secrecy allows them not only to say absolutely nothing about politically sensitive programs in response to media "speculation" but to operate with minimal supervision. The result is skewed information and public misunderstanding of government policy. This is the ultimate means of controlling the public debate: it makes debate irrelevant.

A Glossary

COMINT: Communications Intelligence. Intelligence activity aimed at intercepting coded or uncoded voice, teletype or morse communications. The communications include a wide variety of diplomatic, commercial, political and military "traffic."

ELINT: Electronics Intelligence. Intelligence activity aimed at intercepting non-communications electromagnetic radiations (excluding those produced by radars and the telemetry signals transmitted by missiles and satellites during testing and operations.

Ferret: A low-altitude orbiting satellite which is designed to intercept electronic emanations from radars.

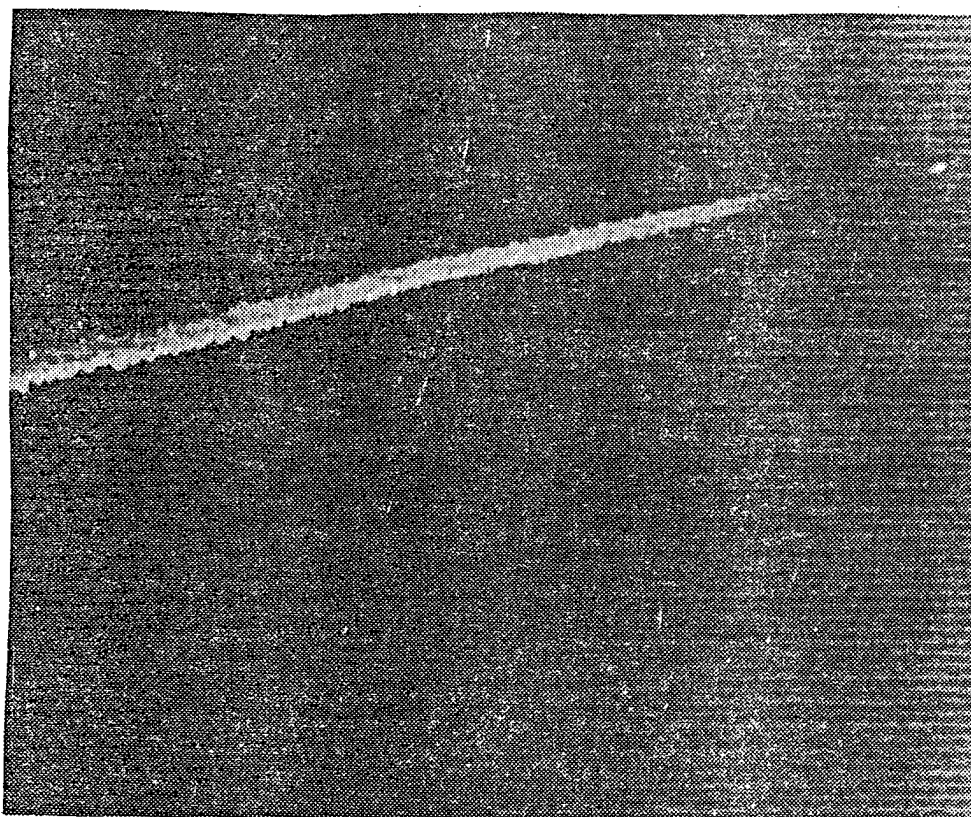
SIGINT: Signals Intelligence. A term comprising both COMINT and ELINT although often used to describe general electronic collection.

Telemetry: The set of signals by which a missile, stage of a missile or missile warhead sends back to earth data about its performance during a test flight. The data relates to features such as structural stress, rocket motor thrust, fuel consumption and guidance system performance. Intercepted telemetry can provide intelligence on the number of warheads carried by a given missile, its range, payload and throw-weight, the probable size of its warheads and warhead accuracy.

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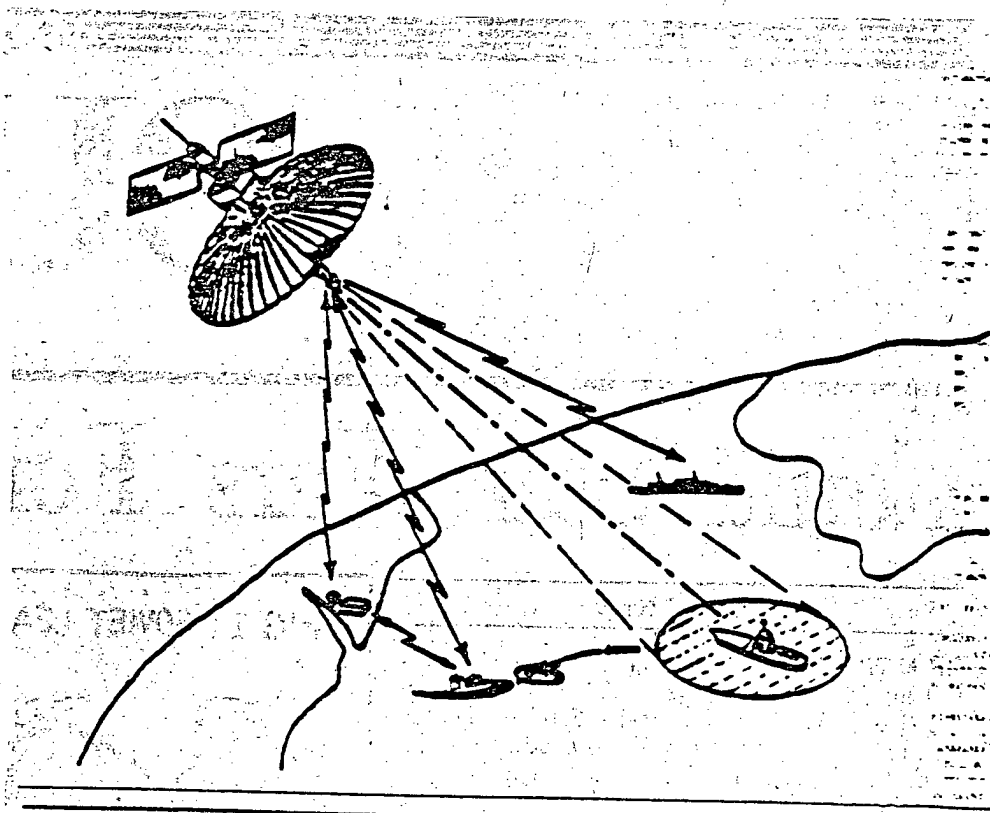
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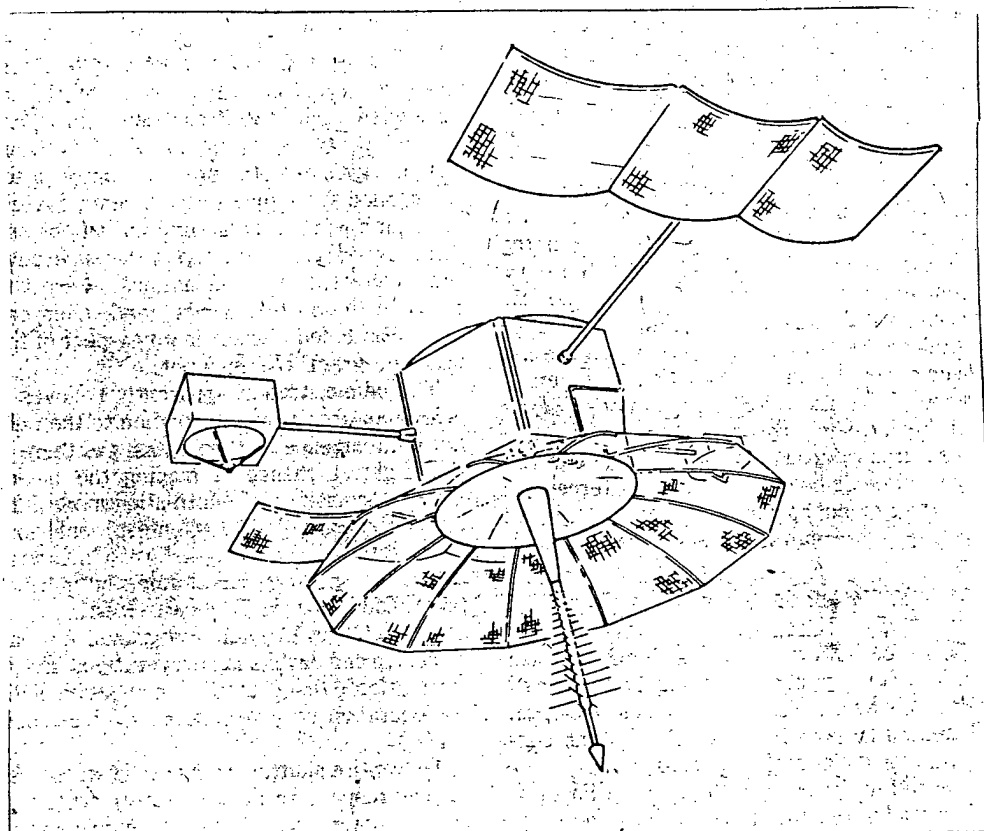
What the Associated Press described as a "super spy" satellite was launched by the United States on June 19, 1970, and was said to be headed for an "orbit over southeast Asia to watch activities in Russia, China and Asia."



Pentagon artist's rendering of the "Clipper Bow" satellite, intended to locate Soviet submarines at sea, but never deployed. The drawing appeared in an unclassified record of congressional hearings.

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TRW Inc. artist's sketch of a Pyramider satellite, designed to give U.S. secret agents a radio link to Washington, but never deployed. The sketch, prepared for a trial, appeared in the best-selling book "The Falcon and the Snowman."